Claims

1. A method of identifying uncorrectable codewords in a Reed-Solomon decoder handling errors and erasures, comprising the steps of:

indicating an uncorrectable codeword when any one or more of the following conditions (a) to (f) is satisfied:

(a) no solution to key equation $\sigma(x)T(x) \equiv \omega(x)\text{mod}x^{2T}$;

(b) $\text{deg}\sigma(x) \neq$ nerrors;

(c) error and erasure locations coincide;

(d) $\text{deg}\omega(x) \geq$ nerrors + nerasures;

(e) nerasures + 2*nerrors > 2T; and

(f) an error location has a zero correction magnitude;

where nerrors and nerasures represent, respectively, a number of errors with reference to an error locator polynomial $\sigma(x)$ and a number of erasures with reference to an erasure locator polynomial $\Lambda(x)$, 2T is the strength of a Reed-Solomon code, $\omega(x)$ is an errata evaluator polynomial, and $T(x)$ is a modified syndrome polynomial.

2. The method of claim 1, comprising evaluating the condition (a) as a preliminary step, and then evaluating the conditions (b) to (f).

3. The method of claim 1, wherein the method comprises identifying a codeword as correctable if none of at least the conditions (a) to (f) are satisfied.

4. The method of claim 1, wherein the method comprises indicating an uncorrectable codeword in response to condition (g) $\deg\Lambda(x) \neq$ nerasures.

5. The method of claim 1, wherein the method comprises receiving the error locator polynomial $\sigma(x)$, the erasure locator polynomial $\Lambda(x)$ and the errata evaluator polynomial $\omega(x)$; forming a set of error locations, and a set of erasure locations, and forming variables nerrors and nerasures representing the size of each set, respectively; and finding $\deg\sigma(x)$, $\deg\Lambda(x)$, and $\deg\omega(x)$, as a degree of the error locator polynomial $\sigma(x)$, the erasure locator polynomial $\Lambda(x)$ and the errata evaluator polynomial $\omega(x)$, respectively.

6. A detector circuit arranged to identify an uncorrectable codeword, for use in a Reed-Solomon decoder handling errors and erasures, the circuit comprising:

a logic unit arranged to identify each condition:

(a) no solution to key equation $\sigma(x)T(x) \equiv \omega(x)\bmod x^{2T}$;

(b) $\deg\sigma(x) \neq$ nerrors;

(c) error and erasure locations coincide;

(d) $\deg\omega(x) \geq$ nerrors + nerasures;

(e) nerasures + 2*nerrors > 2T; and

(f) an error location has a zero correction magnitude;

where nerrors and nerasures represents, respectively, a number of errors and erasures with reference to an error locator polynomial $\sigma(x)$ and an erasure locator polynomial $\Lambda(x)$, 2T is the strength of a Reed-Solomon code, $\omega(x)$ is an errata evaluator polynomial, and $T(x)$ is a modified syndrome polynomial; and

an indicator unit arranged to indicate an uncorrectable codeword, responsive to the logic unit.

7. The circuit of claim 6, wherein the circuit comprises a counter arranged to count nerrors and nerasures as the size of a set of error locations derived from the error locator polynomial $\sigma(x)$, and a set of erasure locations derived from the erasure locator polynomial $\Lambda(x)$, respectively.

8. The circuit of claim 6, wherein the logic unit is arranged to identify an uncorrectable codeword in response to condition (g) $\deg\Lambda(x) \neq$ nerasures.

9. A method of identifying uncorrectable codewords in a Reed-Solomon decoder handling errors and erasures, substantially as hereinbefore described with reference to the accompanying drawings.

10. A detector circuit arranged to identify an uncorrectable codeword, for use in a Reed-Solomon decoder handling errors and erasures, substantially as hereinbefore described with reference to the accompanying drawings.